EXHIBIT 6

CENTERLINE COMMUNICATIONS

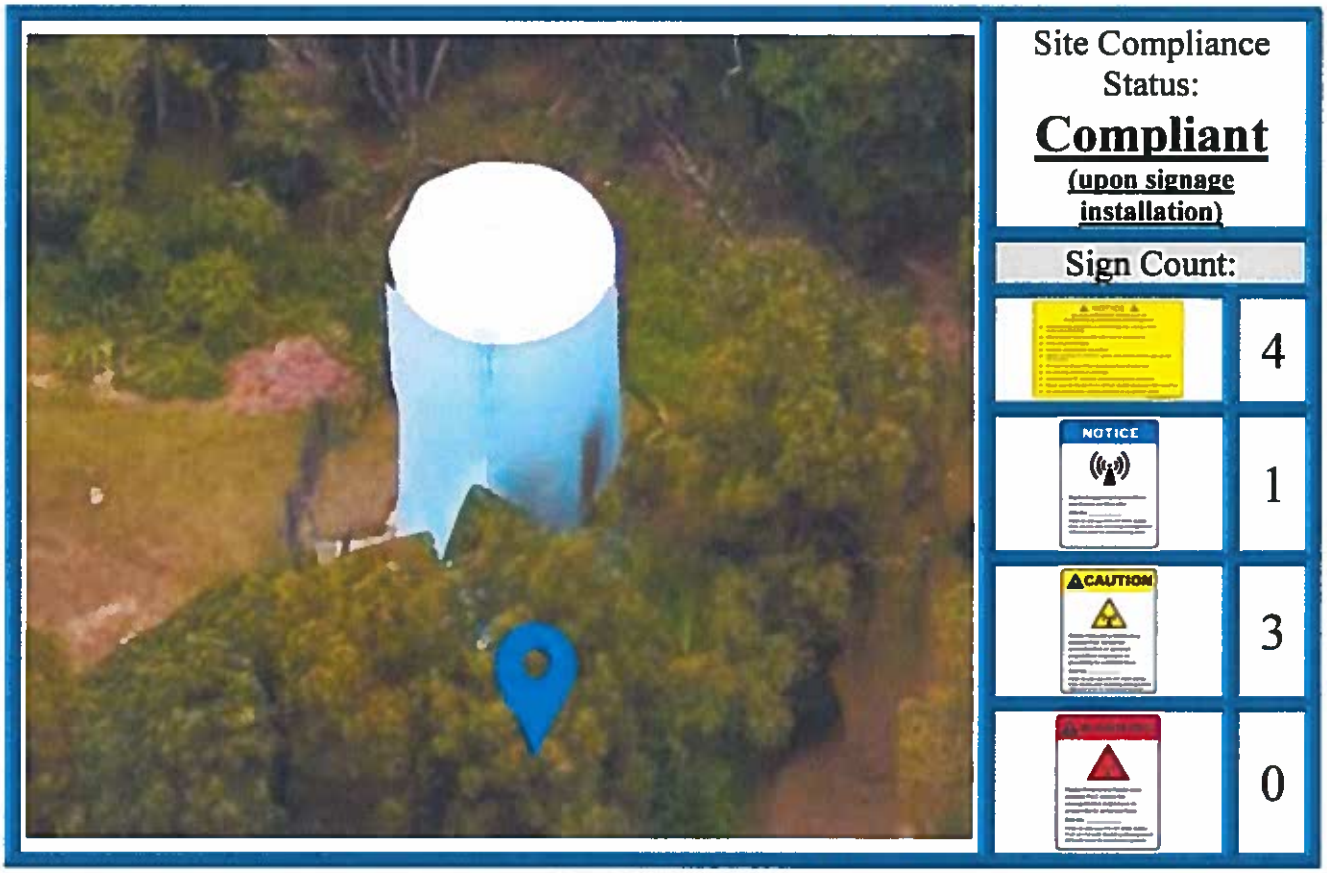
RECEIVED
FEB 28 2018
PLANNING BOARD
GRAFTON, MA

Radio Frequency Emissions Analysis Report

T-Mobile Wireless Water Tank Facility

December 7, 2017

Analysis Format: Theoretical Calculations



950014-043
4WL0968A
WT- Leland Hill WT
29 Leland Hill Road, South Grafton, MA 01757

Prepared For: T-Mobile Northeast
15 Commerce Way, Suite B
Norton, MA 02766

Table of Contents

OVERVIEW

Centerline Communications, LLC ("Centerline") has been contracted to provide a Radio Frequency (RF) Analysis for the following T-Mobile wireless facility to determine whether the facility is in compliance with federal standards and regulations regarding RF emissions. This analysis includes theoretical emissions calculations for all proposed equipment for T-Mobile and any other wireless carriers on site.

Analysis Site Data	
Site ID:	4WL0968A
Site Name:	WT- Leland Hill WT
Site Address:	29 Leland Hill Road, South Grafton, MA 01757
Site Latitude:	42.176197 N
Site Longitude:	-71.703797 W
Facility Type:	Water Tank
Compliance Summary	
Status:	Compliant Upon Signage Installation
Site Composite MPE% (General Public Limit):	196.6 %
T-Mobile Max MPE% (General Public Limit):	196.6 %
Is Access Locked or Controlled? :	Controlled
Lock or Control Measures if Present:	N/A

In addition to the T-Mobile antennas and radio equipment there are antennas and radio equipment for the Town of Grafton which have been included in this analysis as part of the overall site compliance determination.

FCC GUIDELINES

All power density values used in this report were analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu W/cm^2$). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General Population/Uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the 700 and 800 MHz Bands is approximately 467 $\mu W/cm^2$ and 567 $\mu W/cm^2$ respectively, and the general population exposure limit for the 1900 MHz PCS and 2100 MHz AWS bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/Controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure, have been properly trained in RF safety and can exercise control over their exposure. Occupational/Controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure, have been trained in RF safety and can exercise control over his or her exposure by leaving the area or by some other appropriate means. The Occupational/Controlled exposure limits all utilized frequency bands is five (5) times the FCC's General Public / Uncontrolled exposure limit.

Additional details can be found in FCC OET 65.

CALCULATION METHODOLOGY & DATA

Centerline has performed theoretical calculations on all transmission equipment located on this facility. All calculations have been performed using the RoofView® software from Richard Tell Associates. This software performs calculations using a cylindrical model for very conservative power density predictions within the near-field of the antenna where the antenna pattern has not truly formed yet. Within this area power density values tend to decrease based upon an inverse distance function. At the point where it is appropriate for modeling to change from near-field calculations to far-field calculations the power decreases inversely with the square of the distance. This modeling technique is very accurate with very low antenna centerlines, such as rooftops, where persons can get very close to the antennas and pass through fields in close proximity.

The below calculation in Figure 1 shows the theoretical distribution of power over an imaginary cylinder with equal power distribution in all directions.

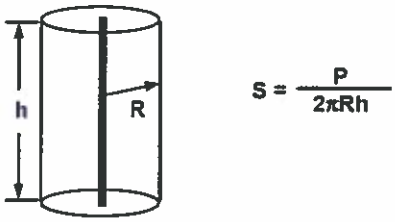


Figure 1: Distribution of power over an imaginary cylinder in all directions

This model can be modified for directional antennas to show directionality of power distribution. This formula will tend to be conservative as it assumes that all power is focused between the 3 dB power roll off points as shown in Figure 2.

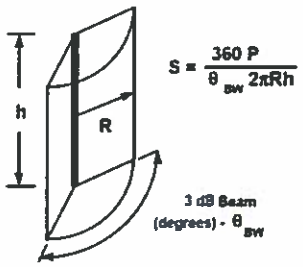


Figure 2: Distribution of power over an imaginary cylinder in all directions

For the required calculations, the following channel assignments and power values shown in **Table 1** were used for the T-Mobile radio configurations per sector.

T-Mobile Channel & Power Data Table

Sector	Frequency Band	Technology	TX Power Per Channel	Number of Channels
A	1900 MHz (PCS)	UMTS	30	2
A	2100 MHz (AWS)	LTE	60	2
A	700 MHz	LTE	30	1
A	700 MHz	LTE	30	1
B	1900 MHz (PCS)	UMTS	30	2
B	2100 MHz (AWS)	LTE	60	2
B	700 MHz	LTE	30	1
B	700 MHz	LTE	30	1
C	1900 MHz (PCS)	UMTS	30	2
C	2100 MHz (AWS)	LTE	60	2
C	700 MHz	LTE	30	1
C	700 MHz	LTE	30	1

Table 1: T-Mobile channel & power data table

The antenna configuration for T-Mobile at this facility is shown below in **Table 2 – T-Mobile Antenna Data Table**. Antenna data for all "other" systems will be shown later in **Table 3 - Total Site Data Table**.

T-Mobile Antenna Data Table

Sector	Antenna Make	Antenna Model	Antenna Gain (dBd)	Antenna Azimuth (degrees)	Antenna Centerline Height (ft)	Antenna Z Value (ft)**
A	Cellmax	CMABDHH/ 6521/E06/ RMU/TB05	18.45 19.05	60	65	6.62
A	Commscope	LNX 6515 DS A1M	14.6	60	65	5.99
A	Commscope	LNX 6515 DS A1M	14.6	60	65	5.99
B	Cellmax	CMABDHH/ 6521/E06/ RMU/TB05	18.45 19.05	180	65	6.62
B	Commscope	LNX 6515 DS A1M	14.6	180	65	5.99
B	Commscope	LNX 6515 DS A1M	14.6	180	65	5.99
C	Cellmax	CMABDHH/ 6521/E06/ RMU/TB05	18.45 19.05	300	65	6.62
C	Commscope	LNX 6515 DS A1M	14.6	300	65	5.99
C	Commscope	LNX 6515 DS A1M	14.6	300	65	5.99

*Table 2: T-Mobile Antenna data table **(Z Value is distance from bottom of antenna to walking surface)*

All calculations for this facility were performed assuming that all radios were running at full power and were uncombined in their RF paths with the configuration shown in table 1. FCC OET Bulletin 65 – Edition 97-01 recommends that modeling of this nature should be done as described prior to yield a worst-case scenario. Due to the dynamic nature of many deployed systems the "real world" values will most likely be less than those shown in this report due to worst-case values being shown in all instances.

For all "Other" systems on this facility, exact equipment was used if available. In instances where "Other" system equipment was not available, standard radio configurations for these systems were utilized based upon prior experience with these systems on facilities in this area.

Total Site Antenna Data Table

Sector	Operator	Frequency Band	TX Power Per Channel	# of Channels	ERP	Antenna Make	Antenna Model	Gain (dBd)	Azimuth (°)	Antenna Centerline Height (ft)	Z Value (ft)**
A	T-Mobile	U1900 L2100	30 60	2 2	12,336	Cellmax	CMABDHH/ 6521/E06/ RMU/TB05	18.45 19.05	60	65	6.62
A	T-Mobile	L700	30	1	745	Commscope	LNX 6515 DS A1M	14.6	60	65	5.99
A	T-Mobile	U2100	30	2	4297	Commscope	LNX 6515 DS A1M	14.6	60	65	5.99
B	T-Mobile	U1900 L2100	30 60	2 2	12,336	Cellmax	CMABDHH/ 6521/E06/ RMU/TB05	18.45 19.05	180	65	6.62
B	T-Mobile	L700	30	1	745	Commscope	LNX 6515 DS A1M	14.6	180	65	5.99
B	T-Mobile	U2100	30	2	4297	Commscope	LNX 6515 DS A1M	14.6	180	65	5.99
C	T-Mobile	U1900 L2100	30 60	2 2	12,336	Cellmax	CMABDHH/ 6521/E06/ RMU/TB05	18.45 19.05	300	65	6.62
C	T-Mobile	L700	30	1	745	Commscope	LNX 6515 DS A1M	14.6	300	65	5.99
C	T-Mobile	U2100	30	2	4297	Commscope	LNX 6515 DS A1M	14.6	300	65	5.99
A	Town of Grafton	460	25	1	70	Celwave	PD201-A	8.97	N/A	65	10.52

*Table 3: Total Site Antenna data table **(Z Value is distance from bottom of antenna to walking surface)*

RESULTS

All calculations performed based upon the data listed for this facility have produced results that are above allowable limits for General Population for exposure to RF emissions as specified by federal standards. T-Mobile can ensure compliance on this facility by following the signage recommendations presented in this report

The anticipated maximum power density value (% MPE) calculated in front of any of the T-Mobile sectors is **196.6 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**39.32%** of the FCC's allowable Occupational limit). This was determined based upon worst-case theoretical modeling as described in this report for all walking surfaces in close proximity to the antenna arrays. The following is a summary for each T-Mobile Sector.

Sector A: There is an area that extends out **2 feet** from the antennas along the walking surface that exceeds the **FCC's General Population limit** for exposure to radio frequency emissions. There are no areas that exceed the **FCC's Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for T-Mobile's Sector A antennas is **193.2 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**38.64 %** of the FCC's allowable Occupational limit). The Sector A antennas are transmitting over the top of the tank.

Sector B: There is an area that extends out **3 feet** from the antennas along the walking surface that exceeds the **FCC's General Population limit** for exposure to radio frequency emissions. There are no areas that exceed the **FCC's Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for T-Mobile's Sector B antennas is **196.6 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**39.32 %** of the FCC's allowable Occupational limit). The Sector B antennas are transmitting over the top of the tank.

Sector C: There is an area that extends out **2 feet** from the antennas along the walking surface that exceeds the **FCC's General Population limit** for exposure to radio frequency emissions. There are no areas that exceed the **FCC's Occupational limit** for exposure to radio frequency emissions. The maximum power density value (% MPE) calculated for T-Mobile's Sector C antennas is **192.8 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**38.56 %** of the FCC's allowable Occupational limit). The Sector C antennas are transmitting over the top of the tank.

At ground level, the maximum power density value (% MPE) calculated for T-Mobile's antennas is **9.9 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**1.98 %** of the FCC's allowable Occupational limit).

The anticipated maximum composite power density value (% MPE) for all transmission sources on this facility is **2.3 %** of the FCC's allowable limit for General Population exposure to radio frequency emissions (**0.46 %** of the FCC's allowable Occupational limit). This composite value determines the overall compliance status for facility and will identify any potential hot spots that may exceed either limit as specified in this report and will help identify any systems that may require mitigation solutions. The below table is a summary of emissions calculations for all other system operators.

Other Carrier Emissions				
Carrier	**Distance GP (feet)**	**Distance Occupational (feet)**	**% GP**	**% Occupational**
Town of Grafton Omni	0	0	4.4	0.88

The FCC mandates that if a site is found to be out of compliance with regard to emissions that any system operator contributing 5% or more to areas exceeding the FCC's allowable limits, as outlined in this report, will be responsible for bringing the site into compliance.

A Composite emissions threshold plot which graphically shows power density values is shown following in **Exhibit 1 – Emissions Thresholds for Walking Surfaces**

Recommended signage for this facility is shown in **Exhibit 2 – Signage Recommendation Plan.**

APPENDIX A - EMISSIONS THRESHOLDS FOR WALKING SURFACES

CENTERLINE COMMUNICATIONS

Operator Antenna Identifiers

- T-Mobile Antennas
- Town of Grafton Antenna

- Emissions Value Over 500% GP limit
- 100 % GP Limit < Emissions Value ≤ 500% GP Limit
- Emissions Value < 100% GP Limit

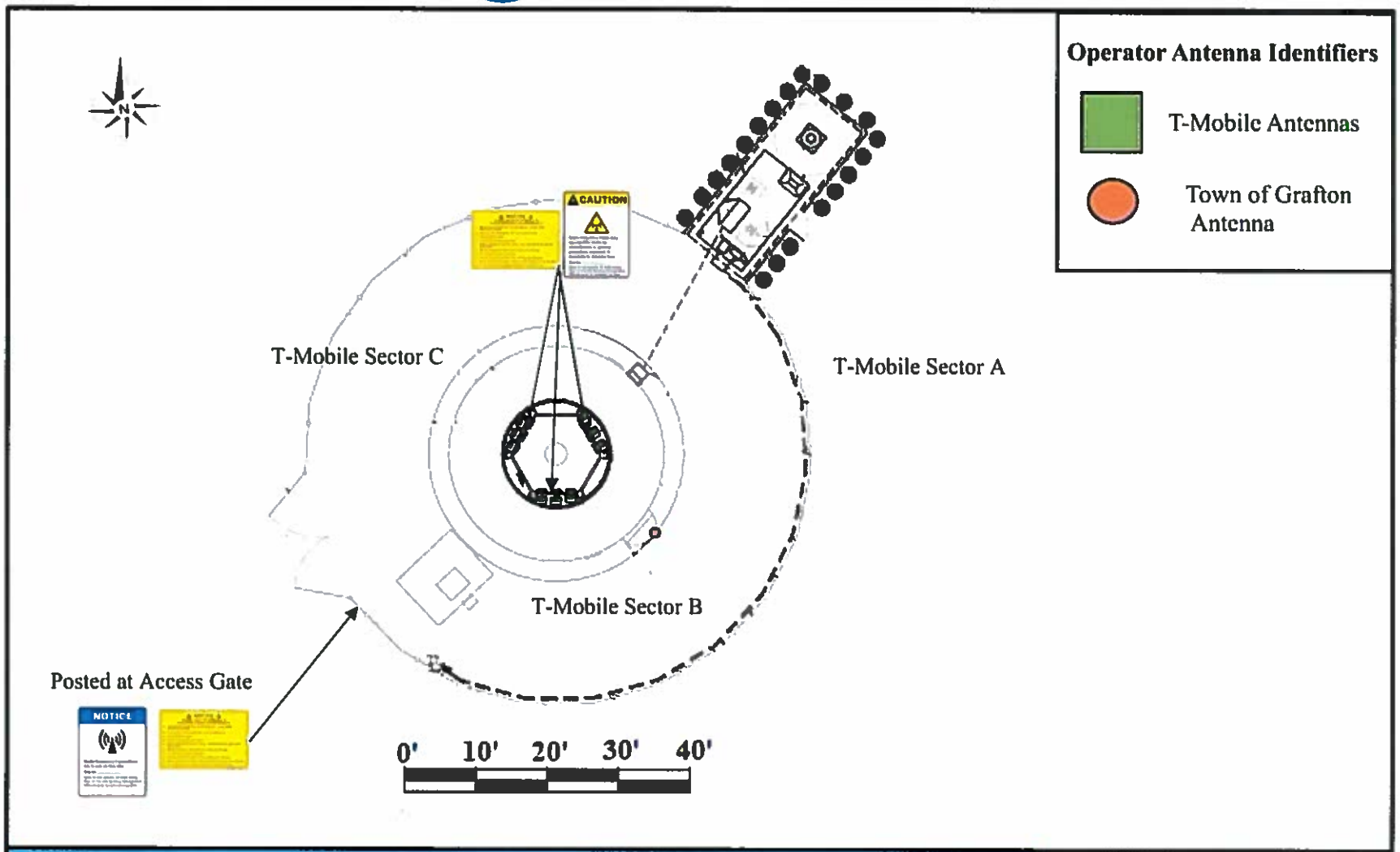
Exhibit 1:

Emissions Thresholds for Walking Surfaces

4WL0968A / WT-Leland Hill WT

Centerline Communications, LLC 95 Ryan Drive, Suite 1 Raynham MA 02767

APPENDIX B – SIGNAGE RECOMMENDATION PLAN



Signage Count								
NOTICE	1		4	CAUTION	3		0	

Exhibit 2: Signage Recommendation Plan

4WL0968A / WT- Leland Hill WT

APPENDIX C- RF SIGNAGE DESCRIPTION TABLE

Sign	Description	Posting Guidelines
	**RF Guideline Sign** Gives guidelines on how to proceed in areas that may exceed either the FCC's General Population or Occupational emissions limits.	Post at access gate and adjacent to the alerting signs at each Sector
	**Blue Notice Sign** Used to inform individuals that they are entering an area that may exceed either the FCC's General Population or Occupational emissions limits. Must be placed anywhere the public can get within 30 feet vertically or horizontally of an antenna.	Post at access gate
	**Yellow Caution Sign** Used to inform individuals that they are entering an area that may exceed the FCC's General Population limit. Must be placed at or near the location of the hot spot.	Post at each sector
	**Red Warning Sign** Used to inform individuals that they are entering an area that may exceed both the FCC's General Population **and** Occupational emissions limits. Must be placed at or near the location of the hot spot.	Not required because there are no areas that exceed the FCC's Occupational Limit

APPENDIX D: FCC EMISSIONS THRESHOLD LIMITS

Table 1: Limits for Maximum Permissible Exposure (MPE)				
(A) Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/cm^2)**	**Averaging Time $[E]^2$, $[H]^2$, or S (minutes)**
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1,500	--	--	f/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Public/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (E) (V/m)**	**Magnetic Field Strength (H) (A/m)**	**Power Density (S) (mW/cm^2)**	**Averaging Time $[E]^2$, $[H]^2$, or S (minutes)**
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

f = Frequency in (MHz)

* Plane-wave equivalent power density

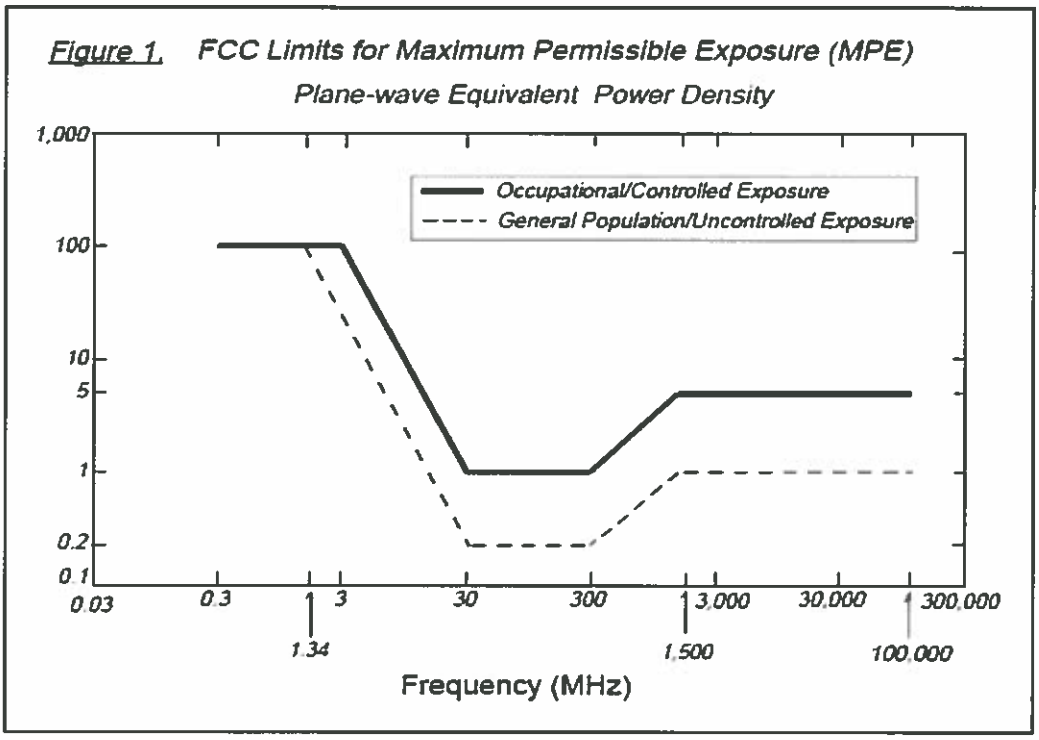


Figure 1. FCC Limits for Maximum Permissible Exposure (MPE)
Plane-wave Equivalent Power Density
1,000
100
10
5
1
0.2
0.1
0.03
0.3
1.34
3
30
300
1,500
3,000
30,000
100,000
300,000
Occupational/Controlled Exposure
General Population/Uncontrolled Exposure
Frequency (MHz)

APPENDIX E: CERTIFICATIONS

I, Ryan McManus, preparer of this report certify that I am fully trained and aware of the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation. I have been trained in the procedures and requirements outlined in T-Mobile's FCC Regulatory Compliance Manual.

12/7/2017

I, Scott Heffernan, reviewer and approver of this report certify that I am fully trained and aware of the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation. I have been trained in the procedures and requirements outlined in T-Mobile's FCC Regulatory Compliance Manual.

12/7/2017